3. Woodyard

3.1 General Description

Pulp and paper production operations require fibrous vegetative material, or furnish, as a raw material. The Catawba pulp and paper plant receives virgin fibers in the form of Southern Pine logs (roundwood furnish) or chips via trucks or railcar. Southern Pine materials are off-loaded and stored for processing, while any hardwoods received at the mill are transported to a neighboring board mill.

To produce a homogeneous pulping feedstock, roundwood furnish (logs) are transported to the debarking drums for processing. The resulting debarked logs are then cut into chips of equal size through the use of chipper machines. As the wood chips exit the chipper, the material is screened for size using a series of vibrating screens. Oversized chips are isolated and transported back to the chipper for further processing. Undersized chips, along with the debarking waste, are conveyed to utilities area for use as a fuel within the facility's boilers.

Raw materials, received in chip form, are screened and processed as noted above. Once the chips, either in-house produced or purchased, are screened, the accepted chips are stored in silos for use by the Kraft or TMP pulp mills.

The woodyard area was part of the original mill construction in 1959. In 1985, half of the original process equipment was replaced with new equipment. The other half of the woodyard equipment was replaced in 1991. As a result of these changes, the log slashing operation constructed in 1959 was eliminated.

3.2 Emission Source/Unit Identification

For permitting purposes, the woodyard Area is considered to be a single emission unit. The primary functions of the woodyard emission unit are to debark and chip the logs in addition to screening and storing the chips. Within this emission unit, the major equipment and emission sources include the following: debarking drums (2), chippers (2), cyclones (7), chip screens (3), rechippers (4), chip storage piles, and storage silos.

The following list gives all emission units at Bowater's woodyard. The list also assigns a number for each emission unit. This number is the Equipment ID Number for the emission unit. The Equipment

Area of Mill	Emission Unit	Equipment ID Number
woodyard	woodyard	1300

ID Number is not the number of any individual piece of equipment in the mill. Rather, it is the number assigned to all pieces of equipment associated with a given emission unit.

Emission estimates for the woodyard emission unit are based on the largest recent historical production rate of the unit. The major raw material of this emission unit is logs and chips, with a receivable rate of about 3,445,000 tons per year. The major product from this emission unit is chips, with a production rate potentially equaling the raw material usage rate or 3,445,000 tons per year. The bark and the woodwaste produced by this emission unit is used as a fuel in the combination boilers (see Sections 17 and 18).

Raw Materials:

logs and chips = 3,445,000 tons/yr

Products:

chips = 3,445,000 tons/yr

3.3 Emission Calculations

Emissions from the woodyard emission unit consist primarily of particulate matter (PM), particulate matter of less than 10 microns in diameter (PM-10), and volatile organic compounds (VOCs). The VOCs may potentially be in the form of hazardous air pollutants (HAPs) or South Carolina toxic air pollutants (South Carolina air toxics, or TAPs), but no substantive data are currently available to speciate the components. It is expected that a portion of the VOCs will be in the form of methanol.

Emissions of PM were estimated using emission factors from AP-42 and emission factors developed by PEDCo. Environmental, Inc. published in EPA Document 450/3-77-010.

3.3.1 Allowable Emissions:

There are five federally enforceable South Carolina standards contained in DHEC Regulation 61-62, Air Pollution Control Regulations and Standards, that could apply to the Bowater woodyard area:

SC Regulation 61-62.1 - Definitions, Permit Requirements, and Emissions Inventory

Section II - Permit Requirements
Emission Limitation: none

SC Regulation 61-62.5 Std. 5- Volatile Organic Compounds
Emission Limitation: none

SC Regulation 61-62.5 Std. 5.1 - Lowest Achievable Emission Rate (LAER) Applicable to Volatile Organic Compounds
Emission Limitation: none

SC Regulation 61-62.6 - Control of Fugitive Particulate Matter
Emission Limitation: none

SC Regulation 61-62.7 - Good Engineering Practice Stack Height
Emission Limitation: none

The woodyard emission unit is not subject to any regulations which specify emission limitations.

3.3.2 Actual Emissions:

Qualitatively, the woodyard emission unit may emit particulate matter (PM and PM-10) and VOCs (the VOCs may be in the form of methanol and/or other HAPs/South Carolina air toxics). Quantitatively, particulate emissions may be estimated by using emission factors developed by PEDCo. The woodyard emission unit contains a number of operations which result in particulate matter emissions. Emission estimates for different operations in the woodyard are given below. For permitting purposes, the woodyard is considered to be a single emission unit.

The woodyard operations at Bowater's Catawba facility that result in particulate matter emissions can be summarized into the following activities: debarking operations, roundwood related chip handling/storage, purchased chip unloading/handling/storage, wastewood hauling, chip piles, and general wood processing.

	PM Emissions (tons/yr)	PM-10 Emissions (tons/yr)	VOC Emissions (tons/yr)
Debarking Operations	26.9	26.9	(*)
Roundwood Related Chip Handling/ Storage	3.0	3.0	(*)
Purchased Chip Unloading/Handling/ Storage	1.2	1.2	(*)
Wastewood Hauling	1.3	1.3	(*)
Chipper Operations	12.1	12.1	(*)
Chip Piles	53.0	25.3	(*)
General Wood Processing	7.5	7.5	(*)
TOTAL:	**105.0**	**77.3**	**(*)**

(*) There are currently no accurate and reliable data available to estimate VOC emissions from woodyard activities.

3.3.3: Debarking Operations (PM):

(assumed to include all debarking drums)

An emission factor for debarking operations has been reported by PEDCo. Environmental, Inc. at the Second Symposium on Fugitive Emissions as a result of work performed for EPA under Contract No. 68-02-1375, Task Order No. 33, publication no. EPA 450/3-77-010. The facility typically debarks about 65% of the cords received. The emission factor is 0.024 lb/ton, and its use is summarized below.

$F = W \times E$

F = fugitive emission resulting from debarking operations, lb/year
W = amount of roundwood debarked, tons/year
E = emission factor, lb fugitive emissions/ton roundwood debarked

F = (0.65 x 3,445,000 tons roundwood/yr)) x (0.024 lb fugitive emissions/ton roundwood)

= 53,742 lb fugitives/yr
= 26.9 tons/yr

3.3.4: Roundwood Related Chip Handling/Storage (PM):

(assumed to include all log handling, chip handling, log storage piles, storage piles, and silos)

An emission factor for roundwood related chip handling/storage operations has been reported by PEDCo. Environmental, Inc. at the Second Symposium on Fugitive Emissions as a result of work performed for EPA under Contract No. 68-02-1375, Task Order No. 33, publication no. EPA 450/3-77-010. The emission factor is 1.0 lb/ton. However, the emission factor was developed for 100% sawdust. Since the total weight of chips contains less than 1% fines, the physical exposure to dusting as compared to 100% sawdust will substantially be reduced. Therefore, a dusting correction factor of 0.5 will be applied which accounts for the reduction to the physical exposure to dusting in the absence of 100% sawdust as given in the above-named reference. Bark accounts for an estimated 10-20% of the total tonnage weighed across woodyard scales (PEDCo.). The percentage of chip fines found in on-site chipping operations has been determined through chip analysis to be 0.4% for pine chipping and 0.3% for hardwood chipping. Bowater's Catawba facility processes mainly pine cords. About 95% of the 3,445,000 tons per year are pine, and about 5% are hardwood. Therefore, the more conservative percentage, 0.4%, will be used to estimate emissions. Emission estimates are:

$$F = W \times (1 - \%B) \times \%F \times E \times C$$

F = fugitive emission resulting from roundwood related chip handling/storage activities, tons/yr
W = amount of roundwood used, tons/yr
%B = fraction of roundwood that is in the form of bark
%F = fraction of roundwood that is in the form of fines
E = emission factor, lb fugitive emissions/ton roundwood used
C = dusting correction factor

F = (3,445,000 tons/year) x (1 - 0.14) x (0.004) x (1.0 lb fugitive emissions/ton pine roundwood) x (0.5)

= 5,925 lb fugitive emissions/year
= 3 tons/year

3.3.5: Purchased Chip Unloading/Handling/Storage (PM):

(assumed to include all purchased chip handling, chip storage piles, and chip silos)

Historical chip classification data indicates that both pine and hardwood purchased chips contain 0.2% fines by weight. The reason that purchased chips have a lower fines content than chips produced on-site is that purchased chips are screened prior to delivery. Typically about 35% of the cords that the facility receives are in the form of chips. The emission factor is 1.0 lb fugitive emissions/ton fines. The emission estimate is

F = W x E

F = fugitive emissions from purchased chip unloading/handling/storage, lb/year
W = amount of fines purchased, tons
E = emission factor, lb fugitive emissions/ton fines

F = (0.35 x 3,445,000 tons/year) x (0.002 ton fines/ton chips) x (1.0 lb fugitive emissions/ton fines)

= 2,412 lb fugitive emissions/year
= 1.2 tons/year

3.3.6: Wastewood Hauling (PM):

(assumed to include all activities associated with woodwaste hauling)

Wastewood contains a predominance of bark and smaller fines and pins particles. According to PEDCo., analyzed mill wastewood samples were found to contain 7.5% fines. The amount of woodwaste hauled at Bowater's Catawba facility is assumed to be 1% of the total tons consumed per year (3,445,000 tons/yr). The emission factor is 1.0 lb fugitive emissions/ton wastewood fines hauled. The emission estimate is

F = W x C x E

F = fugitive emissions resulting from wastewood hauling, lb/year
W = amount of wastewood hauled, tons/year
C = fines concentration of wastewood, ton fines/ton wastewood
E = emission factor, lb fugitive emissions/ton wastewood fines

F = (3,445,000 tons consumed/year) x (0.01 tons woodwaste/ tons wood consumed) x (0.075 tons fines/tons wastewood) x (1.0 lb fugitive emissions/ton wastewood fines)

= 2584 lb fugitive emissions/year
= 1.3 tons/year

3.3.7: Chipping Operations (PM):

(assumed to include all chippers and rechippers)

An emission factor applicable to slasher operations has been developed by PEDCo. Environmental, Inc. at the Second Symposium on Fugitive Emissions as a result of work performed for EPA under Contract No. 68-02-1375, Task Order No. 33, publication no. EPA 450/3-77-010. Although all slasher operations at the facility have ceased, emissions from all chippers and rechippers have been estimated using emission factors for the previous slasher operation. Since the chippers will produce far less sawdust than the slasher operations, emission estimates are an overestimate of particulate matter emissions. The emission factor is 1.0 lb fugitive emissions/ton sawdust produced. Typical saws are 7/16 inches wide, while typical logs are 8 inches in diameter and 50 feet long. A log of these dimensions would be cut by 7 of the 9 saws. Assuming that all cords that the facility receives are sawed gives an emission estimate of 16 tons per year as shown by the following calculations:

$F = W \times N \times E$

F = fugitive emissions resulting from chipping operations, lb fugitive emissions/yr
W = amount of cords chipped per year
N = amount of sawdust produced per cord , lb sawdust/cord
E = emission factor, lb fugitive emissions/ton sawdust

where: $N = L \times C \times S \times A \times D$

L = number of logs per cord
C = number of cuts made per log
S = saw width, ft/cut
A = cross-sectional area of log, ft^2
D = density of the wood, lb/ft^3

N = (10 logs/cord) x (7 cuts/log) x (0.0365 ft/cut) x [π x $(0.333\ ft)^2$] x [(6,000 lb/~~cord~~) x (~~cord~~/128 ft^3)]
= 42 lb sawdust/cord

F = (3,445,000 tons/year x 2,000 lb/ton x cord/6,000 lb) x (42 lb sawdust/cord) x (ton/2,000 lb) x (1 lb fugitive emissions/ton sawdust)

= 24,100 lb fugitive emissions/year
= 12.1 tons/year

3.3.8: Chip Piles (PM):

(assumed to include all log and chip piles)

Table 8.19.1-1 of AP-42 (4th ed.) "Uncontrolled Particulate Emission Factors for Sand and Gravel Processing Plants" reports the following emission factors for active storage piles. The emission factors include the following distinct source operations in the storage cycle: (1) loading of aggregate onto storage piles (batch or continuous drop operations), (2) equipment traffic in storage areas, and (3) wind erosion of pile (batch or continuous operations). The factors assume 8-12 hours of activity per 24 hours, so the emission factors are multiplied by 2 to estimate continuous activity. The factors have a quality rating of D, so it is assumed that the factors are an order-of-magnitude estimate. For this reason, the factors are multiplied by ten for conservatism. The factors for active storage piles are

PM (<= 30 microns):	13.2 lb/acre/day
PM-10:	6.3 lb/acre/day

The chip pile at the Catawba facility has a base diameter of about 250 feet, which corresponds to an area of 49,000 ft^2 or 1.1 acres. The emission estimates are as follows:

PM = (2 x 10) x (13.2 lb/acre/day) x (1.1 acres) x (365 days/yr) x (ton/2,000 lb)
= 53.0 tons/yr

PM-10 = (2 x 10) x (6.3 lb/acre/day) x (1.1 acres) x (365 days/yr) x (ton/2,000 lb)
= 25.3 tons/yr

3.3.9 General Wood Processing (PM):

Although the above categories of woodyard activities will likely account for all particulate matter emissions, the following emission estimate is provided for permitting purposes in order to ensure conservative emission estimates in the woodyard emission unit.

There are eight cyclones in the woodyard emission unit; the cyclones are considered integral parts of the operation, not control devices. Assuming an average outlet grain

loading of 0.02 gr/cf and an average flow rate of 10,000 cfm, emissions are estimated to be:

PM Emissions = (0.02 gr/ft^3) x (10,000 ft^3/min) x (lb/7,000 gr) x (60 min/hr) x (8,760 hrs/yr) x (ton/2,000 lb)
= 7.5 tons/yr

3.3.10 General Wood Processing (VOCs):

There are currently no accurate and reliable emissions data available to estimate VOC emissions from woodyard activities. Bowater will submit woodyard VOC emission estimates when the U. S. EPA and/or NCASI develops validated VOC estimating methods.

3.4 Compliance Plan/Schedule for Emission Unit

Woodyard Emission Unit (Equipment ID No. 1300; Exhaust Point No. 1300):

The fugitive VOCs from this source may be subject to SC Regulation 61-62.5 Standards 5 and 5.1. There are currently no published US EPA AP-42 or wood products industry VOC estimating methods for woodyard activities. Bowater will submit woodyard VOC emission estimates to SC DHEC within 90 days of receipt of applicable published US EPA and/or industry woodyard VOC emission factors or estimating methods. Please refer to Bowater permit hygiene correspondence and the Construction & Operating Air Permit Application submitted to SC DHEC on 1/9/96.

The following discussion is from NCASI Technical Bulletin No. 700 (October 1995), page ii:

> Factors with the potential to affect the release of volatile organic compounds (VOCs) from wood storage piles were identified from a literature review. The review indicated these factors are wood species, history of logs (tree age, harvest time, harvest location, and storage), age of material, temperatures and air convection within the pile, and ambient temperature and humidity. Wood species, history of logs, the time elapsed from wood harvest to chipping, and length of time in storage all influence the level of potentially volatile organic compounds present in the stored material, which in turn affects releases of these compounds. Within the storage pile, several complex biological, microbiological, chemical, and physical processes occur simultaneously which may affect the ultimate release rate of VOCs from the pile surface. Only one literature reference, by Swedish investigators, describing limited field measurements of VOC releases from wood storage piles was found. Exploratory measurements were made by NCASI on long-term storage piles of Douglas fir chips, and estimates of VOC

releases from the surface and during chip retrieval were made from measured VOC concentrations. The estimated emissions were from 1.6 to 3.6 lb C/acre-day from the surface and on the order of 2.4 x 10-4 lf c/Tdw during chip retrieval. A-pinene was the dominant compound released. Plans for additional studies are described.

VOC emissions = (5 acres) x (3.6 lb C/acre-day) x (365 days/yr)
x (ton/2000 lb)
= 3.3 tons/yr

It is felt that this estimate is not representative of the woodyard operations at Bowater's Catawba facility. The information contained in Technical Bulletin No. 700 is very preliminary in nature, and would not be advisable to be used in a Title V inventory. For this reason, the estimate given above is not included on the Title V application forms.